BENEMÉRITA UNIVERSIDAD AUTÓNOMA DE PUEBLA

INSTITUTO DE FÍSICA "Ing. Luis Rivera Terrazas"

SEMINARIO "Jesús Reyes Corona"

"MODEL FOR FULLY DEPLETED NANO-WIRE CORE-SHELL JUNCTION SOLAR CELLS"

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Abstract: Modeling and simulating modern opto-electronic devices have made great contributions to their development. A particular example might be the study of nanowire (NW) solar cells in the radial configuration in which the junction is formed by a core (n or p semiconductor) and a shell (p or n semiconductor), and for which theoretical models are scarce. Hence, in this work, a theoretical model that allows the determination of the electrical performance of this type of solar cells (short-circuit current density, open circuit voltage and efficiency), when both the core and shell semiconductors are fully depleted, is shown. The model also considers electrostatic calculations to determine the conditions for full depletion. Examples of fully depleted nanowire solar cells (based on GaAs and InP semiconductors) are discussed, demonstrating that efficiencies higher than 20% can be achieved, for these absorber materials with small carrier lifetimes of the order of 1 ns, and with nanowire lengths of only 1-2 μm. Eventually, when the carrier recombination lifetimes are increased, this type of devices will become competitive with existing technologies. At the end, it will also be explained how this simple electrical model can be combined with an optical one for an array of NW solar cells, to have a complete opto-electronic model for such an array in the future.

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